# Using root cause analysis techniques in clinical audit

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# Section one

## Introduction

Improving the quality of clinical services requires change. The key to successful clinical audit – or any other quality improvement project – is deciding what changes are necessary, and which will be most effective in bringing about improvement. Firstly, it is necessary to understand why problems identified through clinical audit exist and require change. Clinical audit data can show what the problems have been, but understanding why they have occurred is not always straightforward.

Root cause analysis techniques are used in healthcare to investigate adverse incidents but those same techniques can be used in clinical audit to reveal the underlying failures that need to be addressed to bring about improvement.

The Healthcare Quality Improvement Partnership has commissioned the Clinical Audit Support Centre to produce this guide in order to demonstrate how these techniques can be used in clinical audit.

This guide can be read in conjunction with *HQIP Guide to using quality improvement tools to drive clinical audit*.[1] It should also be noted that root cause analysis and some of the techniques described below can also be used as quality improvement techniques in their own right, see the *Guide to quality improvement methods*.[2]

## About HQIP

The Healthcare Quality Improvement Partnership is an independent organisation led by the Academy of Medical Royal Colleges, The Royal College of Nursing and National Voices. We were established in April 2008 to promote quality in healthcare, and in particular to increase the impact that clinical audit has on healthcare quality improvement.

## About the authors

The Clinical Audit Support Centre (CASC) is an independent limited company responsible for providing best practice and support in clinical audit. They assist healthcare professionals and teams to undertake a wide range of quality improvement initiatives. They also help clinical teams deliver safe and effective care and provide accredited training in clinical audit, significant event audit and root cause analysis. The CASC website is www.clinicalauditsupport.com

## The aim of this guide

This guide aims to improve patient care and clinical audit delivery by providing practical advice on how established root cause analysis (RCA) techniques can 'add value' to clinical audit. The guide is primarily aimed at clinical audit professionals and healthcare staff that participate in clinical audit initiatives at both a local and national level.

## Using this guide

This guide focuses on how different RCA techniques can be incorporated into the clinical audit process. Each section details an established RCA technique and provides:

- A definition/explanation of the RCA technique
- Details of how the technique is applied to patient safety
- Details of how the technique could be applied to clinical audit
- An example of how the technique has been applied to clinical audit
- Signposting to useful resources
- A number of templates used throughout this guide are free to download from hqip.org.uk for local adaptions[3]

This guide draws on best practice in RCA with a view to explaining how RCA techniques can be adapted and used in a clinical audit setting.

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1. http://www.hqip.org.uk/resources/hqip-guide-to-using-quality-improvement-tools-to-drive-clinical-audit/
2. http://www.hqip.org.uk/resources/guide-to-quality-improvement-methods/

## What is root cause analysis?

The origins of RCA are found in the manufacturing industry, with the five whys technique developed by the Japanese inventor Sakichi Toyoda in the 1930s. In subsequent years RCA techniques have evolved considerably and become increasingly sophisticated.

Following the publication of the Chief Medical Officer's Organisation with a Memory in 2000, the National Patient Safety Agency (NPSA) (established 2001 and dissolved in 2012) created a range of RCA resources and encouraged healthcare teams to adopt its methods.

There are many definitions of RCA, but essentially it is a problem-solving technique, however, unlike clinical audit, it is not a singular systematic process but instead an approach that can draw on many different tools, processes and philosophies.

## Understanding the RCA process

NPSA guidance advocates a seven-step process to conduct a full RCA investigation. The stages are as follows:

1. Identifying which incidents should be investigated
2. Gathering the information
3. Mapping the events
4. Analysing the information
5. Barrier analysis
6. Developing solutions and an action plan for implementation
7. Completing a report

The NPSA created a number of excellent resources and documents that focus on how to conduct an RCA in a patient safety context and further details of these can be found via their legacy website[4] and in this guide.

## RCA tools and techniques featured in this guide

- Brainstorming (structured and unstructured)
- Brainwriting
- Cause and effect (e.g. fishbone)
- Change analysis
- Five whys
- Mapping tools: narrative chronology, timelines and time person grids
- Nominal group technique
- Pareto analysis
- Process mapping
- Run charts

4. http://www.npsa.nhs.uk/

# Section Two: RCA tools and techniques

## 1. Brainstorming (structured and unstructured)

In essence, brainstorming aims to generate as many ideas as possible in the shortest period of time and offers many different approaches. Although we focus on unstructured and structured brainstorming these techniques should be considered alongside brainwriting (see pages 6-8) and nominal group technique (see pages 19-21).

### Definition/explanation of the technique

The Oxford English Dictionary defines brainstorming as *'the action or process of making a concerted attempt to solve a problem, usually by group discussion of spontaneously arising ideas'.*

Brainstorming is typically carried out in small groups, who with the support of a facilitator focus on generating ideas or solutions to a single shared question or problem. It is quick and easy to do, requires minimal resources and involves no statistical analysis, it also has the potential to engage numerous stakeholders and generate many ideas. Participants in brainstorming are encouraged to be as creative as possible in the knowledge that their ideas should not be judged or criticised.

1. **Unstructured brainstorming:** Encourages participants to share their ideas as they come to mind. All participants work with the facilitator on the same question/problem but there is no structure and hence participants will typically verbalise their ideas in an unstructured manner. The main advantage is that it is quick to conduct and invite members to offer input, but it can result in one or more person(s) dominating the activity and the facilitator needs to ensure all generated ideas are captured.

2. **Structured brainstorming:** Participants follow rules in order to make the gathering of ideas more orderly and evenly distributed. As with unstructured brainstorming all participants work with the facilitator on the same question/problem but participants are asked one-by-one

to verbalise ideas. This round-robin approach continues until the generation of new ideas is exhausted. A structured brainstorm will typically take longer to conduct and participants may feel under pressure when they are asked for their ideas in front of others. However, the structured approach allows for more equal participation and facilitators will find it easier to capture all ideas.

### How brainstorming techniques are used in relation to patient safety

» As an RCA technique it is typically used to help identify care and service delivery problems

» They may help generate workable solutions to prevent future incidents from occurring again

### How brainstorming techniques can be used to add value in clinical audit

» They provide a suitable technique for helping clinical teams to make clinical audit-related decisions; for example prioritising clinical audit topics, identifying current barriers to conducting clinical audit and so on

» They can help identify why a clinical audit project has not met its full potential; for example such techniques can uncover why actions were not implemented, why a re-audit was not conducted and why the re-audit did not improve patient care

» They help generate ideas for solving 'traditional' clinical audit problems; for example effectively involving patients in clinical audit or raising the profile of clinical audit with senior managers and board members

» They can assist with generating ideas relating to why specific clinical audit criteria and standards are not being met

» They can assist with generating suggestions in terms of the changes and actions that should be introduced to improve sub-standard care

## Example of how brainstorming techniques have been used in clinical audit:

An interface clinical audit group set up a project to assess the management of patients on lithium therapy. The results of the audit identified sub-standard and potentially unsafe care with just 59% of patients having their lithium levels checked in the previous three months. In addition, the initial audit identified only 42% of lithium patients had their renal function checked and just 60% had their thyroid function checked in accordance with best practice timeframes.

Members of the interface audit group (mostly primary care professionals and mental health practitioners) held a structured brainstorming session to try and identify possible changes to implement. One of the ideas generated was the creation of a centralised register for lithium patients. This formed a pilot scheme that reminded patients of their tests and coordinated their ongoing treatment. The pilot proved such a success that further funding was made available to extend the centralized register across the county. The subsequent re-audit results showed significant improvements across all three criteria with 95% of lithium levels checked within three months (up from 59%), 95% of patients receiving their renal function check (up from 42%) and 99% of patients receiving their thyroid function check (up from 60%).

Further information (full reading list on page 34):

- National Patient Safety Agency, 2004. Seven steps to patient safety guide (page 157)[i]
- National Institute for Health and Care Excellence, 2007. How to change practice guide (pages 16-17)[ii]
- NHS Institute for Innovation and Improvement, 2006-2013. Handbook of quality and service improvement tools (pages 254-256)[iii]

## 2. Brainwriting

### Definition/explanation of the technique

Brainwriting is an alternative method to brainstorming that adopts a more uniform approach. The fundamental difference between brainstorming and brainwriting is that brainstorming encourages participants to verbalise their ideas, whereas brainwriting involves participants writing their ideas down.

Once participants have had time to write their ideas down, the facilitator collects the ideas and transcribes all unique ideas onto a flipchart for further consideration. The fundamental benefit of brainwriting therefore is that all participant's ideas are submitted anonymously and only the facilitator can see the source. Like brainstorming, it is designed to generate as many ideas as possible in the shortest period of time.

A wide range of brainwriting methods exist, these include:

1. **Simple brainwriting:** The most common approach involves group members writing their own ideas on a post-it note or card in an agreed time period (for example, five minutes). The facilitator will then take in the ideas and transcribe them into a unique list, discarding duplicates. Afterwards, group members review the list to see if further ideas can be generated.

2. **Brainwriting pool:** Each person in the group writes down their ideas on a post-it note or card and places it in the centre of the table. Other members of the group can then pull out ideas pooled in the centre of the table to use as inspiration. By looking at suggestions from others, team members can create new ideas, variations or piggyback on to existing ideas.

3. **Brainwriting 6-3-5:** In a nutshell this relates to the rules of having **6** people, each writing **3** ideas in **5** minutes, using the table provided (see template 1). At the end of five minutes (or when all members have generated three ideas) the worksheets are passed to the person on their right. The process continues until all members have their original worksheet back. Theoretically 108 ideas should have been generated in 30 minutes and these can now be reviewed.

The clear advantages of brainwriting are that all members are given an equal opportunity to generate ideas and the anonymity of individuals can be maintained, allowing them to be more open. However, the disadvantages of brainwriting are that it takes longer than brainstorming and arguably, lacks spontaneity.

It should also be noted that it is possible to conduct a brainwrite without getting all stakeholders together. For example, a central facilitator could ask participants to email ideas instead of organising a traditional meeting.

### How brainwriting techniques are used in relation to patient safety

» As an RCA technique brainwriting is typically used to help identify care and service delivery problems

» They may help generate workable solutions to prevent future incidents from occurring again

### How brainwriting techniques can be used to add value in clinical audit

» They provide a suitable technique for helping clinical teams to make clinical audit-related decisions, for example prioritising clinical audit topics, identifying current barriers to conducting clinical audit and so on

» They can help identify why a clinical audit project has not met its full potential; for example using brainwriting to uncover why actions were not implemented, why a re-audit was not conducted or why the re-audit did not improve patient care

» They help generate ideas for solving 'traditional' clinical audit problems; for example, involving patients effectively in clinical audit or raising the profile of clinical audit with senior managers and board members

» They can assist with generating ideas relating to why specific clinical audit criteria and standards are not being met

» They can assist with generating suggestions in terms of the changes and actions that should be introduced to improve sub-standard care

## Examples of how brainwriting techniques have been used in clinical audit

### Example 1

A large London hospital Trust conducted an annual record-keeping audit. The audit team recognised that although considerable time and money were spent on conducting the audit, results changed little from year-to-year and compliance was rarely achieved across many of the key clinical audit standards. In order to help understand why the quality of record keeping in the Trust did not meet best practice, the audit team invited clinicians to participate in a remote brainwriting activity. Stakeholders were asked to identify why they did not complete their records in accordance with the audit standards by anonymously completing an online survey. The remote brainwriting activity provided key information that allowed the Trust to better understand why record keeping is sub-standard and subsequently identified changes and actions that could be implemented to address the issue.

### Example 2

A GP practice adopted brainwriting methods to enable their patient participation group (PPG), to generate a list of possible clinical audit topics for the forthcoming year. The PPG was made up of 10 members from a diverse range of backgrounds with a number of outspoken characters. It was agreed that the brainwriting approach would work more effectively than a brainstorming session, as it would enable participants to share their ideas confidentially. The brainwriting exercise identified eight possible clinical audit topics (see also nominal group technique within this guide, to understand how this was subsequently applied to the brainwriting techniques to allow democratic section of three topics to audit).

Further information (full reading list on page 34):

- National Patient Safety Agency, 2004. Seven steps to patient safety guide (page 157)[i]
- Chauncey Wilson , Smashing Magazine, 2013. Using brainwriting for rapid idea generation[ii]

**Template 1:** Brainwriting 6-3-5

| Question/problem: | | | |
|---|---|---|---|
| | Participant 1 | Participant 2 | Participant 3 |
| Idea | | | |

**Instructions:** Participants have five minutes to think of three possible ideas for each question/problem.  Ideas are written down on the grid in the designated box and after five minutes the grids are passed on until all group members have submitted their ideas.

# 3. Cause and effect diagram

## Definition/explanation of the technique

A cause and effect diagram (also sometimes called a fishbone or Ishikawa diagram) enables teams to visualise the potential causes of a particular problem (effect).[5]

The technique was devised by Dr. Karou Ishikawa, a Japanese quality control statistician and was originally used in an industrial context. Essentially, the cause and effect diagram breaks the 'whole' into 'parts', and is particularly helpful in breaking down the relationship between a problem (effect) and all of the possible factors that are related to it.

A cause and effect diagram is often also called a fishbone diagram as the technique creates an illustration that resembles the skeleton of a fish. This is illustrated in the diagram below created by the National Patient Safety Agency's diagram below:

## Diagram 1: Fishbone cause and effect diagram

5.  http://www.mindtools.com/pages/article/newTMC_03.htm
6.  http://www.nrls.npsa.nhs.uk/resources/?entryid45=75605
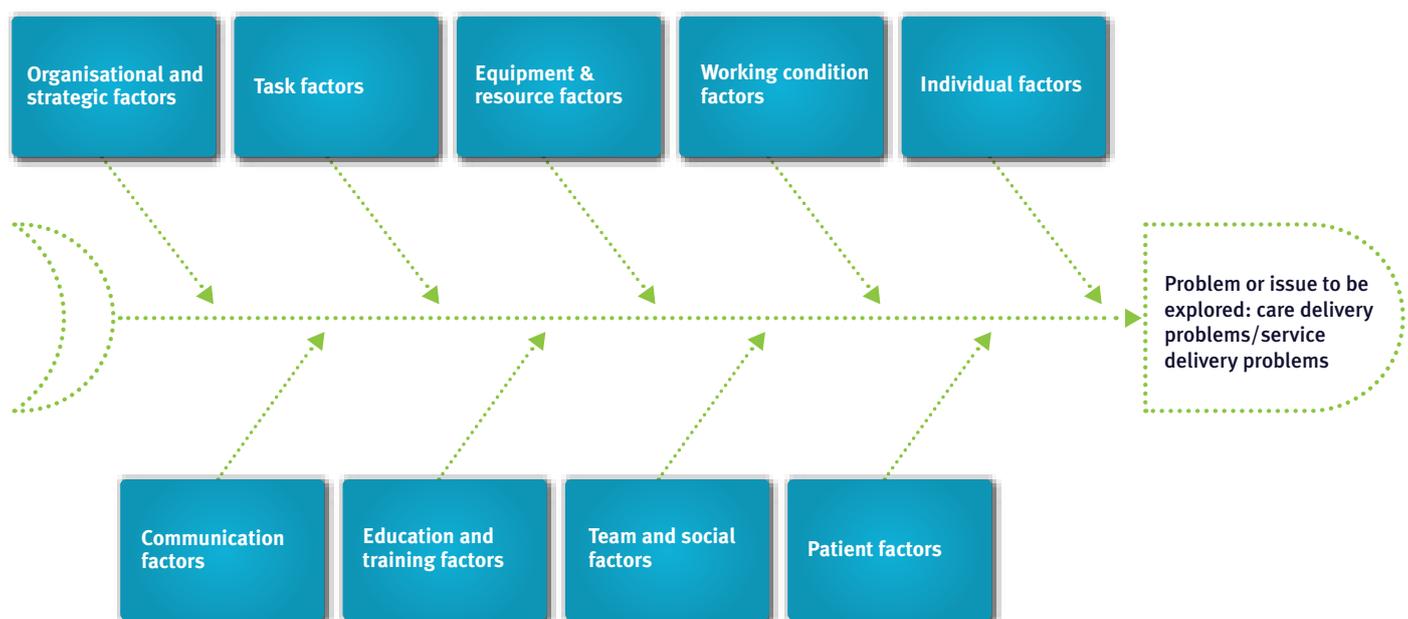
# The four stages in creating a cause and effect diagram

1. **Determine the problem (effect):** as the head of the fish should be the problem you are analysing, which may be referred to as the effect.

2. **Determine categories (causes):** categories are broad factors/causes related to the problem/effect. The NPSA developed their cause and effect template specifically for healthcare organisations. However, teams can review this and agree a different set of categories to aid their discussions.

3. **Review each of the categories:** each category should be reviewed in turn and considered in relation to the problem (effect). This can be via simple brainstorming techniques as it is preferable to try and review each category (cause) exhaustively before moving to the next.

4. **Analyse the diagram:** the team using the cause and effect diagram needs to determine how they will analyse their discussions. Two possible approaches to this are:

   a. Where an agreed template for the cause and effect diagram has been used, for example NPSA template - the diagram can be analysed by reviewing groupings of potential causes around each category. Where more causes are noted under a particular category this may indicate more impact and hence a key root cause to the problem/effect. In turn this category and its associated causes can be considered for appropriate action planning.

   b. When using a cause and effect diagram without pre-determined categories the weight of the impact of the causes can be measured in the size of the 'bones'. For instance the larger bones closer to the head of the fish may represent a bigger impact, while small bones further away from the head have a smaller impact. Or as above, the causes with the most grouping may indicate most impact and can be identified as the foundation for action planning.

## How cause and effect diagrams are used in relation to patient safety

The cause and effect diagram is typically used to separate and categorise possible causes of a problem or incident. The focus relates to the content of the problem/incident rather than the history of the problem (the history of the incident is dealt with during the mapping phase). Analysis of the diagram may enable teams to understand the root cause/s of the problem or incident with the overall aim to ensure that appropriate actions are implemented.

## How cause and effect diagrams can be used to add value to clinical audit

» In the context of clinical audit results, the diagrams can assist in understanding why a non-compliant result was reported. By utilising the cause and effect diagram the team review the clinical audit criteria (the effect) in relation to possible reasons (causes) why the level of performance was below compliance levels

» To review areas that are problematic within the clinical audit; for example engagement of junior doctors, patient and service user involvement or utilising national audit results to enable local improvements

## How cause and effect techniques have been used in clinical audit

» The cause and effect fishbone diagram (Diagram 2) was used by a team of clinical audit professionals to review the engagement of junior doctors in the clinical audit process. The exercise demonstrated a wide variety of causes leading to a lack of engagement of junior doctors, and highlighted the need for appropriate action planning in relation to clinical audit training and associated support for junior doctors

## Diagram 2: Cause and effect diagram reviewing the engagement of Junior Doctors in clinical audit process

| Equipment | Individual Factors | Time |
|---|---|---|
| • Only allowed a set number of case notes in some organisations<br>• No space to undertake the work<br>• Limited or no access to previous clinical audits undertaken | • Lack of interest in available topics (resistance to tackle some areas)<br>• Don't get to see outcome of changes implemented so don't see quality improvements. This undermines the value of understanding<br>• Poor experience leads to poor quality audits | • Competing priorities<br>• Busy shift patterns<br>• Junior Doctors may leave their clinical audit until later in their rotation – placing pressure on themselves and the CA team<br>• No allocated time for task |

**→ Junior Doctor engagement**

| Organisations | Team Factors | Training |
|---|---|---|
| • Different organisational structures for clinical audit e.g. audit registration requirements<br>• Access to case notes<br>• Maybe little or no clinical audit team support for Junior Doctors as organisation focuses on national audit programme<br>• Advertise the clinical audit team to determine what help can and cannot be provided | • Lack of direction<br>• Engagement of senior staff/clinicians<br>• Given as a task to some Junior Doctors rather than the individual choosing to participate | • Is training at the right time of day?<br>• Is the content of training right?<br>• Problem caused by junior doctors being able to set criteria and standards<br>• Not trained in how to write a good report<br>• Analysis skills training may be required |

Further information (full reading list on page 34):

- NHS Institute for Innovation and Improvement, 2006-13. Handbook of quality and service improvement tools (pages 44-47)[i]
- National Patient Safety Agency, 2010. RCA tools: analysing to identify contributory factors and root causes[ii]
- Institute for Healthcare Improvement, 2015. Cause and effect diagram[iii]

# 4. Change analysis

## Definition/explanation of the technique

Change analysis is a very simple approach that essentially compares what did happen with what should have happened. It is typically used to identify divergences from an agreed process to help identify why a problem/failure occurred.

## The four stages involved in conducting change analysis

1. **Map the perfect process:** Use the process mapping technique to effectively create a fault-free, step-by-step exemplar model of what should happen. The process should be as detailed as possible.

2. **Compare:** Make a comparison of what actually happened against the perfect process. This will help to identify areas of divergence, i.e. indicating where appropriate/ best practice was not followed. All the divergences should be listed.

3. **Prioritise:** If more than one divergence occurred then these should be prioritised, i.e. consideration given to which divergence had the greatest impact.

4. **Resolve:** Each divergence needs to be assessed to understand why the perfect process was not adopted. Changes may be required and or new barriers and procedures put in place to ensure that similar divergences do not occur again.

## How change analysis is used in relation to patient safety

» Within RCA, change analysis is often used to help identify care and service delivery problems

» They often help uncover the causes of an incident

» They may help generate workable solutions to prevent incidents from occurring again, particularly in relation to identifying barriers that need to be implemented or new systems of working

## How change analysis techniques can be used to add value in clinical audit

Clinical audit compares actual care and service delivery to best practice and therefore is similar to change analysis in many respects. Clinical audits that focus on process (rather than structure and outcome) are essentially adopting the change analysis model. However, change analysis may be useful to provide further information in a clinical audit context:

» They help pinpoint the particular stage/s in a process where best/agreed practice is not being followed

» They can help generate alternative processes that are more user-friendly and safer for those involved and hence improve compliance

## Example of how change analysis techniques have been used in clinical audit

A local clinical audit looking at venous thromboembolism (VTE) identified that less than 30% of patients admitted to hospital had their VTE prophylaxis documented in their electronic patient record. This result fell considerably below the government's quality target of 90%.

By creating a process map of accepted procedure for the admission of patients and the recording of VTE assessment in the patient record, it was noted that clinical staff accessed the electronic patient record but did not always complete the VTE assessment. As a result, the team introduced a computer pop-up box. It appears with a link to the VTE assessment form in the electronic patient record and although this can be snoozed, it re-appears whenever the patient record is accessed up until the point that the VTE form has been completed.

As a result of introducing this simple change, the re-audit identified that the number of patients with a VTE assessment in their notes increased from under 30% to 71% in only a couple of weeks.

**Template 2: Change analysis grid**

**Instructions:** Start by listing what would constitute best practice in relation to the process/system under review. Once this has been carried out, complete the 'actual' practice column to identify if any divergences have occurred. Where divergences have occurred, consider if these have caused sub-standard care and then prioritise each divergence (e.g. rank each divergence in order of importance – most important should be addressed first) before agreeing changes required.

| System/process under review: | | | | | | |
|---|---|---|---|---|---|---|
| | Perfect practice | Actual practice | Was there divergence? **Yes/No** | Did the divergence lead to sub-standard care? **Yes/No** | Ranking of divergence | Changes required |
| Step 1 | | | | | | |

# 5. Five whys

## Definition/explanation of the technique

The five whys is a simple problem-solving technique that simply asks the question *why?* in order to get to the root cause/causes of a problem. The method was originally developed by Sakichi Toyoda and was used within the Toyota Motor Corporation during the evolution of its manufacturing methodologies. The basic premise is that individuals and/or teams continue to ask 'why?' enough times in a row in order to detect the root cause/causes of an incident. However, the term 'five whys' is slightly misleading as it may take more or less than five whys to get to the root cause. In addition, those using this approach should also be aware that it is known by several different names; for example, why-why chart, Gemba Gembutsu (Japanese for 'place where the problem has happened') and 5Y.

## The two stages involved in conducting the five whys

1. **Identify:** Isolate the specific problem/question you want to know more about.

2. **Ask why:** Use brainstorming to answer why the problem occurred and then write down the answer. If the first answer does not identify the root cause of the problem, ask why again and use brainstorming to identify a further answer. Continue to use this approach until an answer identifies a measure that would have resulted in an appropriate outcome.

The five whys is a simple non-statistical problem solving technique that can quickly identify contributory factors and the root cause of a problem. However, although the technique is straightforward, there are a few further tips for ensuring it is effective:

1. Take care phrasing your starting question. This must be clear and non-judgmental, for example 'why did the nurse give the patient incorrect medication?' apportions blame to the nurse. A better starting question would be 'why was the patient given incorrect medication?'.

2. Look for answers grounded in fact, i.e. focus on what happened, not what might have happened.

3. Understand that the five whys process may lead participants down an unhelpful cul-de-sac that does not identify solutions. If this is the case there is nothing wrong with:
   - going back a stage in the process
   - going back to the beginning and starting again
   - re-phrasing the starting question to see if this provides a more productive starting point

4. Try to drill-down as far as possible, by asking why as many times as possible. If you try to fix the problem too quickly you may be dealing with the symptoms not the problem.

## How the five whys technique is used in relation to patient safety

» To help uncover the root cause and contributory causes of an incident

» To help identify evidence of a broken process and pinpoint where barriers failed or where alternative barriers could have made a difference

» To help generate workable solutions to prevent future incidents from occurring again

6. http://www.graphicproducts.com/tutorials/kaizen/

## How the five whys can be used to add value in clinical audit

» To help identify why a clinical audit project has not met its full potential; for example the five whys can identify at what stage the project started to fail

» To help a clinical team understand why care is sub-standard

» To assist clinical audit teams to understand a wide variety of problems or failed initiatives, for example, why a clinical audit breached patient confidentiality, why an audit was presented externally without prior Trust approval, why data for a national audit was submitted late or why a clinical audit data collection form did not capture the required information

## Examples of how the five whys have been used in clinical audit

**Example 1**
A clinical audit team based in Leicester used the five whys to understand how they had lost 60 clinical audit forms submitted to them by a local GP practice. All six members of the audit team participated in the five whys exercise and the outputs are listed below:

PROBLEM: 60 CLINICAL AUDIT FORMS FROM A GP PRACTICE LOST. **WHY?**

• Audit forms were shredded before data had been scanned. **WHY?**

• It was assumed the audit forms had been scanned. **WHY?**

• The cover sheet had a tick in the top corner so a new audit facilitator assumed the data had been scanned and thus shredded the forms. **WHY?**

• Because the new audit facilitator was not aware the tick denoted that the practice had been contacted to inform them their audit forms had been received (not scanned). **WHY?**

**There was no departmental system for ensuring new staff understood how audit data was managed.**

By applying the five whys in this instance, the audit team identified a number of problems including: a broken process, no system for induction and poor communication. Subsequently, the audit department wrote a short protocol for the management of audit data that ensured all new/temporary staff were briefed and that data could only be shredded when two members of the team had counter-signed the new approval to destroy audit forms document.

**Example 2**

**The clinical audit team from Norfolk and Suffolk NHS Foundation Trust shared the following example:**

The clinical audit team at Norfolk and Suffolk NHS Foundation Trust worked with members of the mental health team to conduct an important audit project focusing on record keeping in accordance with crisis planning and contingency care plans. The results of the first audit identified sub-standard care across all audit criteria (see table to the left).

Members of the audit team reported the results back to the clinicians and facilitated a short meeting in which the mental health team were encouraged to adopt the five whys process to assess their audit results and identify contributory factors that stopped best practice from being attained. Using the five whys approach, three main problems emerged:

1. Informal and inadequate understanding of the plans by some staff
2. Confusion between doctor and nurse teams in terms of who had responsibility for completing documentation within the plans
3. Flaws in the design of the care plans and associated paperwork

After the five whys had identified problems, the audit team worked with the mental health team to create a suitable action plan to address the key issues. Significant changes were introduced, including: training for staff, reviews of communication arrangements and the introduction of new paperwork. As a result of changes, the re-audit led to significant improvements:

| Criterion | Audit 1 | Audit 2 | Change |
|---|---|---|---|
| 1. Evidence of what to do in an emergency | 56% | 90% | +34% |
| 2. Details of who to contact | 67% | 81% | +14% |
| 3. Contact details | 44% | 67% | +23% |
| 4. Foreseeable emergency plans (eg. ill carer) | 56% | 48% | -8% |
| 5. Evidence of a plan that guides | 44% | 85% | +41% |
| 6. Service users views recorded | 44% | 86% | +42% |
| 7. Plan signed by service user | 11% | 75% | +64% |
| 8. Plan lists other relevant agencies | 78% | 76% | -2% |
| 9. Plans signed by carer | 0% | 36% | +36% |

Further information (full reading list on page 34):

- NHS Institute for Innovation and Improvement, 2006-2013. Handbook of quality and service improvement tools (pages 48-50)[i]
- National Patient Safety Agency, 2004. Seven steps to patient safety guide (page 158)[ii]

# 6. Mapping techniques

## Definition/explanation of the technique

In RCA, mapping process performance over time provides the ability to review any changes made to the process. The most popular/common mapping techniques used in RCA are:

1. **Narrative chronology:** This is essentially a diary account of what happened in date/time order. It is constructed using information that has been collected from a number of different sources and collated into one account. The approach works best when reviewing information over a short timeframe.

2. **Tabular timeline:** Information is mapped into a table. For each incident, information is supplied in relation to: the nature of the incident; the date; the time; supplementary information (if available); good practice (where identified) and care/service delivery problems. Compared to a narrative chronology the tabular timeline allows more detail to be recorded over a longer period of time.

3. **Time person grid:** Provides mapping of a concentrated time period when it is important to understand precisely who was doing what, where and when. This makes it easier to check one person's actions throughout an incident, or to see what each individual was doing at one specific point in time.

## How mapping techniques are used in relation to patient safety

» Mapping enables the incident team to make sense of the evidence available, often by using staff and patient testimony

» Mapping can help piece together information to create a clearer picture in relation to the sequence of events

» Mapping is a simple approach to collating and ordering evidence that helps us better understand the physical environment and why certain decisions were made

» Mapping can identify decisions and changes that impacted on the performance of a process

## How mapping techniques can be used to add value in clinical audit

» To enable in-depth information to be reviewed beyond the typical quantitative clinical audit data

» To provide valuable case study information, for example to help understand why care is sub-standard and its potential impact

» To provide the ability to review clinical processes and understand where they are not working effectively

» To assist with reviewing why specific audit criteria and standards are not being met

» To assist in reviewing the impact of changes and action plans, in particular where there has been a change in process

## Examples of how mapping techniques have been used in audit

**Example 1: Tabular timeline**

An Accident and Emergency (A&E) Department conducted a local clinical audit that identified the proportion of patients who breached the national 12-hour target for admission to a hospital bed. Quantitative analysis identified that the department was falling short of the target and performing in the bottom third of Trusts in England. When reviewing the quantitative clinical audit data senior clinicians and managers asked if case studies could be carried out on patients who had exceeded the 12-hour target in order to:

A. Help identify reasons for delay

B. Help bring the data to life by detailing the consequences of patients not meeting the 12-hour audit target

Subsequently, the entire stay of 15 affected patients was comprehensively mapped using the tabular timeline approach. The A&E clinical notes, electronic patient system and radiology system provided much of the documentary evidence. Once mapping had been completed an A&E consultant reviewed individual patients to determine good practice and care or service delivery problems.

The resulting outputs and case studies were shared with senior management and clinical teams. Both the quantitative clinical audit data and the detailed patient maps were used to develop a comprehensive action plan. Stakeholders in the project considered the tabular timelines invaluable in illustrating actual patient experience. Indeed, a number of the timelines were used as a learning exercise within the wider Trust.

**Example 2: Time person grid**

A conventional clinical audit of nutritional care indicated that on one ward support for patients at mealtimes was lacking. To help understand why care was sub-standard, the ward team agreed to complete a time person grid during mealtimes. The grids were analysed and these indicated that staffing was insufficient and other clinical pressures on the ward resulted in sub-standard care. Following wider discussion of the results an action plan was devised with the main change being the use of volunteers to provide more support to patients at mealtimes.

Further information (full reading list on page 34):

• National Patient Safety Agency, 2010. *RCA investigation: other useful templates*[i]

**Template 3: Tabular timeline**

**Instructions:** Begin by stating why the tabular timeline is needed (e.g. details of the problem under consideration). Review the available information to populate the grid. This is a simple process and starts with the dates, times and details of what happened in chronological order. This is followed by completion of the four additional rows (what should have happened, any other information, missing information and good practice).

| Reason for tabular timeline: | | | | | | |
|---|---|---|---|---|---|---|
| | Perfect practice | Actual practice | Was there | Did the divergence lead to sub-standard care? **Yes/No** | Ranking of divergence | Changes required |
| Event date and time (24 hour clock) | | | | | | |
| Event – What happened? | | | | | | |
| What should have happened? (Complete if reviewing a process) | | | | | | |
| Any other information | | | | | | |
| Missing information | | | | | | |
| Good practice | | | | | | |

**Template 4: Time person grid**

**Instructions:** begin by stating why the time person grid is needed (e.g. details of the problem under consideration). Review the available information to populate the grid. This is a simple process and involves listing the staff members in the left-hand column and the time at which they carried out each activity. By populating the grid you will gain a full picture of what each person was doing at the corresponding time.

| Reason for time person grid: | | | | | | |
|---|---|---|---|---|---|---|
| Time (use 24 hour clock) | | | | | | |
| Staff member (by role) | Activity | Activity | Activity | Activity | Activity | Activity |
| | | | | | | |

# 7. Nominal group technique

## Definition/explanation of the technique

Nominal Group Technique (NGT) shares some features of brainstorming and brainwriting and is essentially a tool for generating ideas and ranking them.

In their *Seven Steps to Patient Safety* guide the NPSA defined NGT as 'another structured method of generating a list of ideas, prioritising the ideas of a whole group or deciding which ideas to explore further'[7]. More formal than brainstorming or brainwriting, NGT is a simple consensus-building and voting tool that enables all group members to participate. It is called 'nominal' because in the process of generating ideas the group does not interact, making it ideal for controversial issues.

## The four stages for conducting NGT

1. **Generating ideas:** The most common approach is for the facilitator to present the group members with the same question/problem and then conduct a brainwriting activity with members writing down their ideas in silence.

2. **Recording ideas:** The facilitator continues to adopt the standard brainwriting approach, collecting the ideas from group members and transcribing the unique ideas onto a flipchart.

3. **Discussing ideas:** The facilitator continues with the brainwriting format and invites all group members to discuss the ideas that have been generated in more detail. This provides all members of the group an opportunity to seek clarity, use the piggyback technique to extend ideas and to generate new ideas. This continues until the creation of new ideas has been exhausted.

4. **Voting on ideas:** The facilitator creates a 'ballot-paper' (see template 5) listing all the ideas that group members have generated up to this point. Group members then vote privately using a voting card (see template 6) to prioritize the ideas. In most instances voting is completed by individual group members ranking the ideas from first to third or first to fifth. Once all votes have been cast the facilitator will count the votes (using template 7) and provide group members with the results. Therefore, unlike brainstorming and brainwriting, NGT not only helps generate ideas, it also helps to rank and prioritise them.

The clear advantage of NGT is that it enables groups to reach a consensus on which ideas rank most highly and this is achieved in a confidential and democratic way. NGT is an excellent approach to take when there is likely to be conflict and disagreement among group members and/or when a controversial issue is being examined. The disadvantages of NGT are that it takes time to conduct, needs an organised and strong facilitator and arguably lacks spontaneity (compared to brainstorming).

It should also be noted that it is technically possible to conduct an NGT without getting all stakeholders together at a meeting. For example, a central facilitator could ask participants to email ideas and the NGT process (including voting) could be carried out remotely.

7.  http://www.nrls.npsa.nhs.uk/resources/collections/seven-steps-to-patient-safety/?entryid45=59787

## How NGT techniques are used in relation to patient safety

» Within RCA, NGT is typically used to help identify care and service delivery problems

» NGT often helps uncover the causes of an incident

» NGT may help generate workable solutions to prevent incidents from occurring again

## How NGT techniques can be used to add value in clinical audit

» They can help clinical teams to make clinical audit-related decisions, for example, prioritising clinical audit topics or identifying current barriers to conducting clinical audit

» They can help identify why a clinical audit project has not met its full potential, for example, NGT can be used to uncover why actions were not implemented, why a re-audit was not conducted or why the re-audit did not improve patient care

» They can help teams to agree clinical audit criteria and standards by consensus, for example where best practice is lacking NGT can assist a team in helping agree what key elements of care could be measured

» They help generate ideas for solving 'traditional' clinical audit problems, for example involving patients effectively in clinical audit or raising the profile of clinical audit with senior managers and board members

» They can assist with generating ideas in terms of why specific clinical audit criteria and standards are not being met

» They can assist with generating suggestions in terms of the changes and actions that should be introduced, to improve sub-standard care

## Examples of how NGT techniques have been used in clinical audit

**Example 1**

As stated in the brainwriting section of this guide a GP practice adopted brainwriting methods to empower members of their patient participation group (PPG) to identify audit topics for the forthcoming year. The brainwriting activity identified eight possible topics for audit:

A. access to appointments

B. in-clinic waiting times

C. management of household diabetics

D. management of osteoporosis

E. patients who do not attend (DNA) for appointments

F. repeat prescribing

G. telephone access

H. translation service for patients

All 10 members of the PPG were then given three votes of equal value to select their preferred topics and the secret ballot led to the following results: access to appointments 9, telephone access 7, patients who do not attend (DNA) for appointments 6, in-clinic waiting times 3, repeat prescribing 2, management of household diabetics 1, management of osteoporosis 1 and the translation service for patients 1.

| | |
|---|---|
| Access to appointments | 9 |
| Telephone access | 7 |
| Patients who do not attend (DNA) for appointments | 6 |
| In clinic waiting times | 3 |
| Repeat prescribing | 2 |
| Management of household diabetics | 1 |
| Management of osteoporosis | 1 |
| Translation service for patients | 1 |

As a result of conducting the NGT it was agreed that the three audits the practice would conduct in the next year would be: access to appointments, telephone access and patients who do not attend (DNA) for appointments.

**Example 2**

A Community Trust noted that engagement in clinical audit for health visitors was particularly low. As a result, the Trust used a monthly meeting of health visitors (HVs) to conduct an NGT with a view to identifying their particular barriers to clinical audit. The brainwriting activity identified barriers such as lack of senior engagement, lack of local clinical audit resources, lack of understanding/need for training, fear of audits, experience of audit results being used punitively, lack of time, limited opportunity for HVs to select audit topics, lack of awareness of audit team and so on.

The health visitors then voted on the issues identified and the top three were: lack of time, lack of training and lack of awareness of the audit team. Subsequently, the audit team used this information to deliver a series of local clinical audit training sessions specifically for health visitors that included: advice on best practice in clinical audit methodology, guidance on how to conduct quick rapid-cycle audit projects and information on how to access the audit team and details of the support available.

Further information (full reading list on page 34):

- National Patient Safety Agency, 2004. Seven steps to patient safety guide (pages 157-158)[i]
- Department of Health and Human Services, Evaluation Briefs No.7, November 2006 Gaining consensus among stakeholders through Nominal Group Technique.(pdf)[ii]

**Template 5: NGT ballot paper**

**Instructions:** Once all members of the group have conducted a brainwriting or brainstorming activity to generate ideas, - 10 ideas should be written/typed onto the ballot paper. Remember that only unique ideas should appear on the ballot paper. If there are more or less than 10 ideas then the ballot paper should be adjusted accordingly.

| Idea 1 | |
|---|---|
| Idea 2 | |
| Idea 3 | |

**Template 6: NGT voting card**

**Instructions:** once all of the unique ideas have been transcribed onto the ballot paper, then each member of the group will be given a voting card allowing them to cast their votes independently and anonymously. Each voter has the opportunity to make three selections and these are ranked in the following order: first choice (3 points), second choice (2 points) and third choice (1 point). Once all votes have been cast the facilitator collects all ballot papers and calculates the result.

| Idea selected: ballot paper number and brief details | |
|---|---|
| 1st choice (3 points) | |
| 2nd choice (2 points) | |
| 3rd choice (1 point) | |

**Template 7: NGT results calculator**

**Instructions:** once all members of the group have voted then the facilitator needs to calculate which ideas have gained the most points. This is a simple process that involves counting the number of votes for each idea and attributing points accordingly. For example, if idea 1 gained 3 first choice votes, 3 second choice votes and 3 third choice votes, then the total points accumulated would be 18 (3 x 3 points = 9) + (3 x 2 points = 6) + (3 x 1 point = 3).

| | Brief details of idea | Points accumulated from 1st choice votes (three per vote) | Points accumulated from 2nd choice votes (two per vote) | Points accumulated from 3rd choice votes (one per vote) | Total points |
|---|---|---|---|---|---|
| Idea 1 | | | | | |
| Idea 2 | | | | | |
| Idea 3 | | | | | |
| Idea 4 | | | | | |

# 8. Pareto analysis

## Definition/explanation of the technique

Pareto analysis can be defined as 'a simple technique that helps you to focus efforts on the problems that offer the greatest potential for improvement'.[8]

It is a statistical technique based on the Pareto principle (also known as the 80/20 rule). The principle is named after Vilfredo Pareto, an Italian sociologist, economist and philosopher who made a number of observations that supported the idea that 20% of causes generate 80% of results. For example, it might be seen that:

- 80% of patient safety incidents involve 20% of procedures

- 80% of the doctor's time is spent on 20% of patients

- 80% of complaints come from 20% of patients

- 80% of sub-standard record keeping comes from 20% of staff

Using this principle can help identify significant causes so that improvement resources can be directed accordingly. It should be noted however that the 80/20 rule is only an arbitrary guide, and in reality 85% of the results may be generated by 15% of a cause group.

## The three stages of Pareto analysis

1. **Identify** the problem you want to know more about and use a tool to identify possible causes, such as the fishbone diagram, or brainwriting.

2. **Interpret** the data by selecting the most meaningful unit of measurement that relates to the cause of your problem, for example, frequency or cost, and rank these in order of size (high to low) for comparison.

3. **Illustrate** the findings using a Pareto graph, which is a bar chart listing cause groups on the horizontal axis and a measurement unit on the vertical axis. For example, the Pareto graph (Diagram 3) below shows 12-hour diagnostics standard breach data from a hospital emergency department. The horizontal axis represents the day in two-hour blocks and the vertical axis represents the number of times the 12-hour diagnostics standard was breached, set against the percentage value. The graph shows that over 80% of the breaches occurred from midnight to 2am, and from 2am to 4am.

## Diagram 3. Pareto graph: No. of emergency department 12-hour diagnostics standard breaches by time of day and percentage
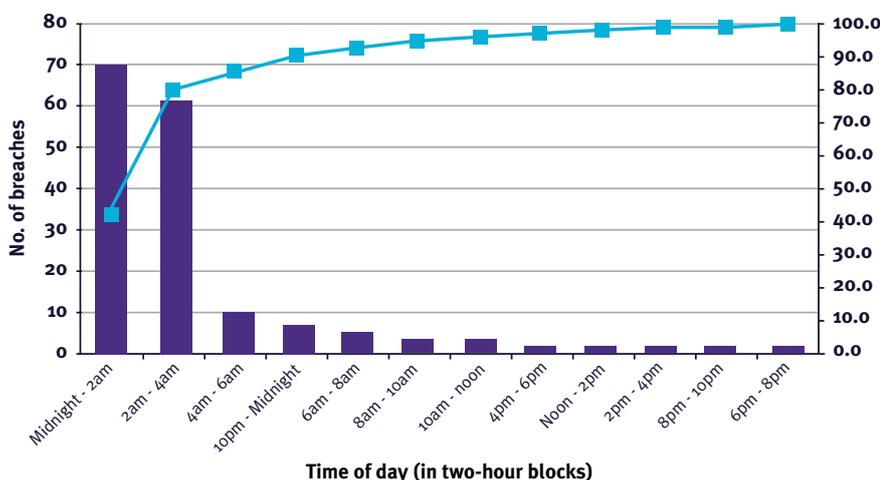


In this example, the graph has been enhanced using a cumulative percentage (blue) line. Cumulative percentages show frequency distribution at each interval to help compare data sets as they accumulate. A cumulative percentage line can be automatically generated using Excel[1].

1. Excel Easy, 2015. Pareto Chart, http://www.excel-easy.com/examples/pareto-chart.html

## How Pareto analysis is used in relation to patient safety

» It can help uncover the main causes of an incident and focuses on these

» It can help generate workable solutions to prevent incidents from occurring again

## How the pareto analysis can be used to add value in clinical audit

» It can assist with generating ideas in terms of why specific clinical audit criteria and standards are not being met

» It can assist with generating suggestions relating to changes and actions that should be introduced to improve sub-standard care

» It can assist a clinical audit team in identifying the main barriers to completing a clinical audit and/or the stage at which clinical audit most frequently fails

## Example of how the Pareto analysis has been used in audit

The GP practice featured in the run chart section of this guide identified that in 2014 the median number of missed appointments (Did Not Attend/DNAs) was 80 per week.

The practice decided to examine the DNA data in more detail, with particular focus and scrutiny on the patients who missed their appointments.

Analysis of this data upheld the Pareto principle and identified that 20% of those patients not attending appointments were responsible for 80% of the missed appointments, i.e. a small number of patients were repeatedly not attending their appointments and thus significantly inflating the the problem. As a result, the practice decided to focus their attention on this small group of patients.

Further information (full reading list on page 34):

• NHS Institute for Innovation and Improvement, 2006-2013. Handbook of quality and service improvement tools (pages 53-56)[i]

• Mind Tools, 1995 – 2015. Pareto analysis using the 80:20 rule to proritize[ii]

• Institute for Healthcare Improvement website, 2015. Pareto diagram[iii]

• American Society for Quality (ASQ) website, 2005. Pareto chart iv

• Excel Easy, 2015. Pareto Chart, http://www.excel-easy.com/examples/pareto-chart.html v

# 9. Process mapping

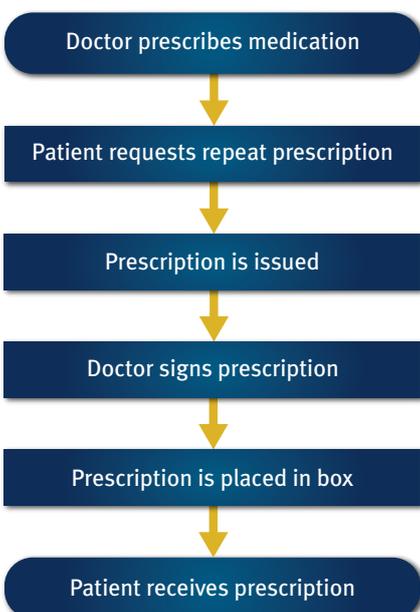## Definition/explanation of the technique

This tool enables the whole patient journey or a complete diagnostic pathway to be reviewed and mapped. It also allows for the separation of steps within the management of a condition e.g. activities, interventions, staff and patient interactions.

It is important that the patient's journey is mapped before any service changes are implemented. Any changes need to be based on facts and process mapping enables the healthcare team to establish the way in which processes are currently working.

Start with a basic map with a maximum of five to 10 steps. The high level map establishes the scope of the process, identifies significant issues and provides start and end points for the more detailed map.

Diagram 4 is a basic process map showing the repeat prescribing process in a GP surgery.

Detailed maps are necessary for complex processes and identify all steps and interactions. They can also establish which professional/role is interacting with the patient as specific process points, as well as any areas of duplication, bottlenecks and task allocation. The detailed map can also be used again later in the project to show the impact of any improvement actions, as the process can be re-mapped to show where problems/issues have been addressed.

There are specific symbols that are routinely used to develop a process map; these are:

- **Rounded rectangles** mark the start and end points of the map
- A **rectangle** marks a single step in the process
- A **diamond** represents a decision point
- **Arrows** illustrate the direction of the process flow

## Diagram 4: Map of the repeat prescribing process in a GP surgery



Doctor prescribes medication

Patient requests repeat prescription

Prescription is issued

Doctor signs prescription

Prescription is placed in box

Patient receives prescription

## How process mapping is used in relation to patient safety

It is unlikely that one individual will know all of the processes that a patient undergoes during a diagnostic journey. The bullet points below identify key benefits to mapping the patient's journey:

» A reference point for any improvement project, large or small

» An opportunity to bring multidisciplinary teams together

» An overview of the complete process to help staff understand how difficult things can be for patients

» An aid to highlight where changes might be most effective

» A catalyst for creative ideas

» An event to draw the team together and foster a sense of ownership

» An important end product that can be used and updated in light of changes introduced

## How process mapping can be used to add value to clinical audit

When a process is to be audited as part of a clinical audit project it can be very helpful to understand how the clinical process is currently working. The process map can provide information about time taken, delays, handovers to other professionals, professionals involved, order of the process and overlap with other processes.

Equally at the stage when the analysis from the data collection is being reviewed by the clinical team, a process map can help the team to understand their results, particularly if certain aspects of the process are problematic.

Clinical audit teams rely on strong administrative processes to keep the clinical audit programme in their organisation on target. Where it is identified that these aren't working so well, a process map could be a useful technique to use in reviewing the process.

## Example of how process mapping has been used in audit:

The clinical audit team from Mid Cheshire Hospitals NHS Foundation Trust conduct an annual away half-day to review and plan the work of the department. As part of one of these events the audit team found that their internal audit documentation was not working effectively.

The clinical audit team process mapped the life cycle of a clinical audit project including documentation used in the Trust. This showed that three documents must be completed: registration form, outcome form and an audit report. The process map identified that the outcome form wasn't necessary, potentially causing delays and in some instances staff didn't know how to complete the form. The result from the process mapping exercise was to remove the outcome form from the Trust's audit process. Follow-up after this decision showed that Trust staff considered this change to be a positive one, saving valuable time and improving the internal monitoring of clinical audits.

Further information (full reading list on page 34):

• NHS Institute for Innovation and Improvement, 2006-2013. Handbook of quality and service improvement tools (pages 93-100)[i]

• Royal College of Nursing, 2006. Process mapping[ii]

# 10. Run charts

## Definition/explanation of the technique

Run charts map chronological data to identify and enable the study of variation over time. They show changes in performance, which help reveal underlying causes. For example, a chart of waiting times in clinic against days of the week might demonstrate certain days when waits are unacceptably long. To improve this we can investigate why variations occur on those days, and what can be done to reduce them.

In a typical run chart the horizontal axis is a time scale (for example, minutes, hours, days, weeks, months, quarters, years, etc.) and the vertical axis represents the indicator or variable being studied (for example, patients who do not attend, infection rates, medication errors, patient falls, readmission rates, etc.).

Diagram 5 (taken from Perla et al) provides an example of a run chart showing compliance with a clinical procedure. The chart presents weekly compliance results against the median (middle value) result (red line), and it is clear that changes made in weeks six to 13 have significantly improved care. Although the goal of ·····⦚90% (dotted line) has not yet been reached.
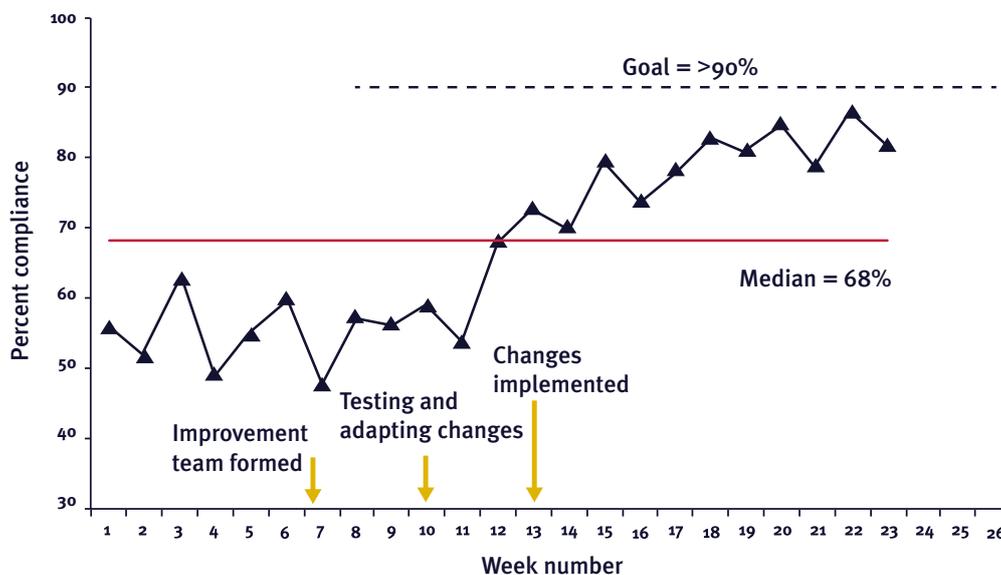


Diagram 5: Run chart: Percentage compliance with procedure by week

The advantage of a run chart over clinical audit is that it provides ongoing data, whereas clinical audit typically focuses on two data collection points that are often weeks or months apart. Run charts enable those implementing changes to see the impact of their interventions as they are made, and are therefore useful in monitoring the implementation of action plans. However, unlike clinical audit, run charts require consistent access to data over the timeframe studied.

The Institute of Healthcare Improvement advocate the use of run charts because improvement should naturally take place over time, and describe run charts as 'one of the most important tools in performance management'.[9]

9.  http://www.ihi.org/resources/Pages/Tools/RunChart.aspx

## Template 8: Run chart rules and table

Run charts present the number of runs within a series of data. By analysing run charts it is possible to conclude that a non-random pattern has emerged. This occurs in a number of instances:

1. When there is a **SHIFT** = six or more consecutive points above or below the median

2. When there is a **TREND** = five or more consecutively increasing or decreasing points

3. When there is an **ASTRONOMICAL POINT** = a data point dramatically different from all others

4. When there are **TOO MANY OR TOO FEW RUNS** = data that does not conform to the rules in the table below:

| Total number of data points on the run chart that do not fall on the median | Lower limit (i.e. below number stated = too few) | Upper limit (i.e. above number stated = too many) |
|---|---|---|
| 10 | 3 | 9 |
| 11 | 3 | 10 |
| 12 | 3 | 11 |
| 13 | 4 | 11 |
| 14 | 4 | 12 |
| 15 | 5 | 12 |
| 16 | 5 | 13 |
| 17 | 5 | 13 |
| 18 | 6 | 14 |
| 19 | 6 | 15 |
| 20 | 6 | 16 |
| 21 | 7 | 16 |
| 22 | 7 | 17 |
| 23 | 7 | 17 |
| 24 | 8 | 18 |
| 25 | 8 | 18 |

Table is based on about a 5% risk of failing the run test for random patterns of data.
Adapted from Swed FS and Eisenhard C. Tables for testing randomness of grouping in a sequence of alternatives.
Ann Math Stat 1943;14:66-87

## How run charts are used in relation to patient safety

- They enable healthcare teams to map and monitor patient safety incidents, for example, infection rates or death rates, to identify problem areas

- They can help measure the impact of changes made as part of the RCA process, for example, whether the number of problems or errors identified have subsequently been reduced

- They help to identify why problems occur, for example, illustrating that a patient safety incident in a hospital emergency department may have been caused, in part, by a significant increase in patients attending, thus overloading staff on duty

## How run charts can be used to add value in clinical audit

- They can help pinpoint why care is sub-standard, for example, patterns may be identified from run chart data such as standards not met on particular days of the week, or at particular times of the day

- They enable assessment of the impact of changes made through action planning, for example if a significant change is made as a result of an audit, run charts will demonstrate whether the change has had the desired effect

- They can help audit and clinical teams understand demand for the services they provide by tracking demand over time

## Example of how run charts have been used in clinical audit

The run chart shown in diagram 6 shows the number of patients not attending (Did Not Attend/DNAs) for their appointments, by week, at a GP practice. The practice had previously conducted clinical audits to focus on this problem, and run charts provided them with a clearer understanding of the situation.

The practice agreed an audit standard and goal of 'no more than 50 patient DNAs per week', illustrated by the green line in diagram 6 (overleaf). The run chart also illustrates that the median number of DNAs per week, illustrated by the red line in diagram 6, is 80, and therefore work needs to be done to reach the desired standard.

The results also show that despite the practice changing their appointment system in the summer of 2014, the number of DNAs did not improve. Indeed, if one examines the chart, most values in the final quarter cluster around the median, whereas the results for the first quarter fluctuate between the goal and median lines, indicating that DNAs are increasing.

The practice agreed to implement a series of changes in 2015:

1. Target patients who frequently do not attend.
2. Implement text messaging to remind patients of their appointment 24 hours beforehand.
3. Run a local campaign to highlight the impact of DNAs to patients.

The practice will continue to use run charts to map the number of DNAs per week, thus enabling them to see if the changes made have the desired impact.

## Diagram 6: Patients not attending (did not attend/DNAs) appointments, by week, at a GP practice.



**Date: Week commencing, 2014**
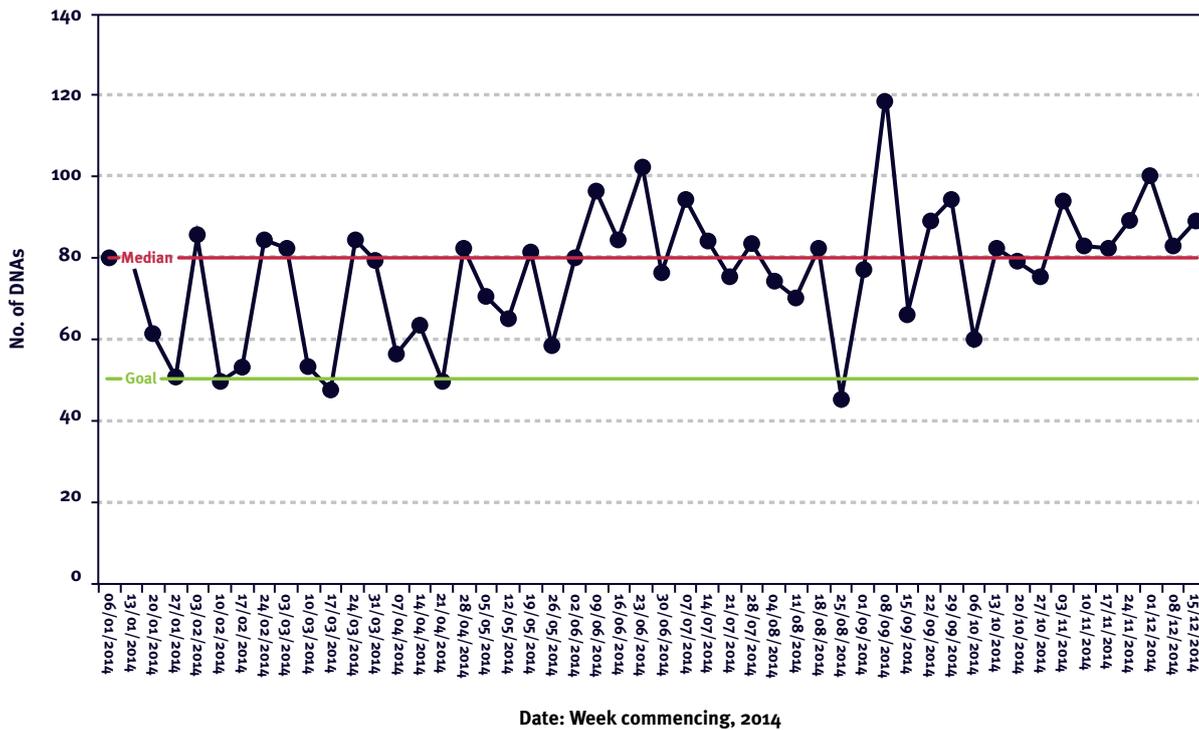
Further information (full reading list on page 34):

- Institute for Healthcare Improvement, 2015.
  Web-based training using run and control charts
  to understand variation

- Institute for Healthcare Improvement, 2015. Run
  chart tool

- Perla RJ, Provost LP, Murray SK, 2011. The run chart:
  a simple analytical tool for learning from variation in
  healthcare processes, BMJ Qual Saf 2011;20:46-51

# Further reading list

**Brainstorming**: Page 7

i.  National Patient Safety Agency, 2004. *Seven steps to patient safety guide* (page 157)
ii. National Institute for Health and Care Excellence, 2007. *How to change practice guide* (pages 16-17)
iii. NHS Institute for Innovation and Improvement. 2006-2013. *Handbook of quality and service improvement tools* (pages 254-256)

**Brainwriting:** Page 9

i.  National Patient Safety Agency, 2004. *Seven steps to patient safety guide* (page 157)
ii. Chauncey Wilson, Smashing Magazine, 2013. *Using brainwriting for rapid idea generation*

**Cause and effect:** Page 11

i.  NHS Institute for Innovation and Improvement, 2006-13. *Handbook of quality and service improvement tools* (pages 44-47)
ii. National Patient Safety Agency, 2010 *RCA tools: analysing to identify contributory factors and root causes*
iii. Institute for Healthcare Improvement, 2015. *Cause and effect diagram*

**Five whys:** Page 16

i.  NHS Institute for Innovation and Improvement, 2006-2013. *Handbook of quality and service improvement tools* (pages 48-50)
ii. National Patient Safety Agency, 2004. *Seven steps to patient safety guide* (page 158)
iii. Mapping techniques section
iv. National Patient Safety Agency, 2010. *RCA investigation: other useful templates*

**NGT:** Page 22

i.  National Patient Safety Agency, 2004. *Seven steps to patient safety guide* (pages 157-158)
ii. Department of Health and Human Services, Evaluation Briefs No.7, November 2006 *Gaining consensus among stakeholders through Nominal Group Technique* (pdf)

**Pareto analysis:** Page 25

i.  NHS Institute for Innovation and Improvement, 2006-2013. *Handbook of quality and service improvement tools* (pages 53-56)
ii. Mind Tools, 1995 – 2015. *Pareto analysis using the 80:20 rule to proritize*
iii. Institute for Healthcare Improvement website, 2015. *Pareto diagram*
iv. ASQ website, 2005. *Pareto chart*

**Process mapping:** Page 28

i.  NHS Institute for Innovation and Improvement, 2006-2013. *Handbook of quality and service improvement tools* (pages 93-100)
ii. Royal College of Nursing, 2006. *Process mapping*

**Run charts:** Page 30

i.  Institute for Healthcare Improvement, 2015. *Web-based training using run and control charts to understand variation*
ii. Institute for Healthcare Improvement, 2015. *Run chart tool*
iii. Perla RJ, Provost LP, Murray SK, 2011. *The run chart: a simple analytical tool for learning from variation in healthcare processes*, BMJ Qual Saf 2011;20:46-51

# References

1. http://www.hqip.org.uk/resources/hqip-guide-to-using-quality-improvement-tools-to-drive-clinical-audit/

2. http://www.hqip.org.uk/resources/guide-to-quality-improvement-methods/

3. http://www.hqip.org.uk

4. http://www.npsa.anhs.uk/

5. http://www.mindtools.com/pages/article/newTMC_03.htm

6. http://www.graphicproducts.com/tutorials/kaizen/

7. http://www.nrls.npsa.nhs.uk/resources/collections/seven-steps-to-patient-safety/?entryid45=59787

8. http://www.institute.nhs.uk/quality_and_service_improvement_tools/quality_and_service_improvement_tools/pareto.html

9. http://www.ihi.org/resources/Pages/Tools/RunChart.aspx

10. http://qualitysafety.bmj.com/content/20/1/46.abstract

February 2016